

Fueling the Future: The Potential for Forests



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USDA Cooperative State Research,
Education, and Extension Service

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Discussion Map

- Let us set the stage.
- What is woody biomass and its potential role?
- What is happening?

Humanity's Top Ten Problems for next 50 years*

1. **ENERGY**
2. **WATER**
3. **FOOD**
4. **ENVIRONMENT**
5. **POVERTY**
6. **TERRORISM &
WAR**
7. **DISEASE**
8. **EDUCATION**
9. **DEMOCRACY**
10. **POPULATION**

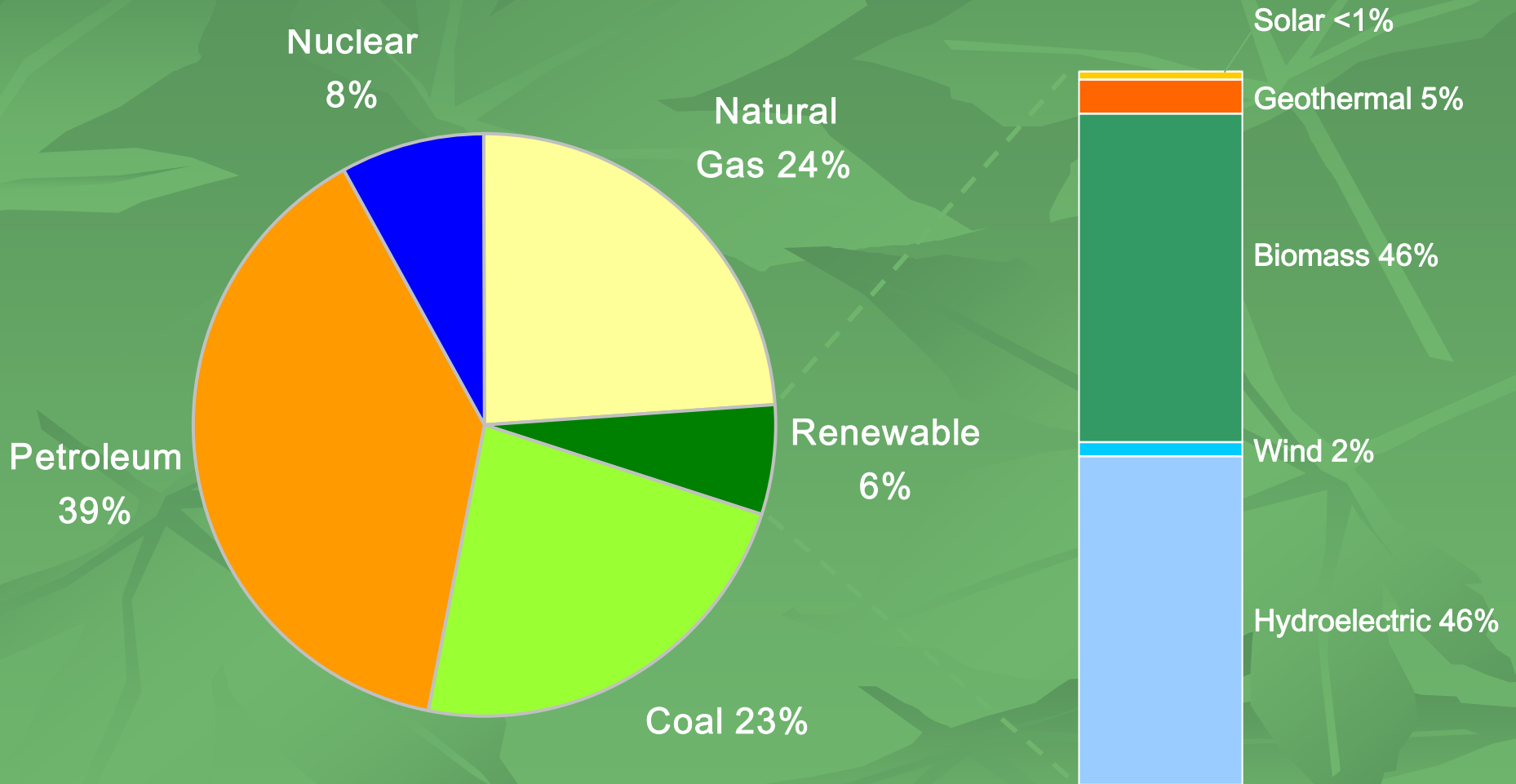
2003	6.5	Billion People
2050	8-10	Billion People



*Dr. Richard Smalley, Rice University
1996 Nobel Prize

US Energy Supply

(data for 2003)



Source: AEO 2004 tables (released in December 2003) based on US energy consumption. Overall breakdown Table A1 (Total Energy Supply and Disposition), and Renewable breakdown Table A18 (Renewable Energy, Consumption by Section and Source). Slide courtesy Mile Pacheco, NREL, US-DOE.

Fossil Fuel Situation

- Current worldwide demand for oil
 - 81 Million barrels/day
 - 6 barrels used for every 1 discovered
 - Production at 95% capacity
- Demand in 20 years
 - 121 Million barrels/day
- Where will it come from?
 - Unstable countries (Saudi Arabia, Iraq, Iran, Venezuela)
 - Undesirable locations (ANWAR, Deep-platforms, Near-shore)
- Natural gas
 - Shortage in 10 years?

U.S. Dependence on Foreign Oil

Have Oil

Saudi Arabia	26%
Iraq	11%
Kuwait	10%
Iran	9%
UAE	8%
Venezuela	6%
Russia	5%
Libya	3%
Mexico	3%
China	3%
Nigeria	2%
U.S.	2%

Use Oil

U.S.	26%
Japan	7%
China	6%
Germany	4%
Canada	4%
Russia	3%
Brazil	3%
S. Korea	3%
France	3%
India	3%
Mexico	3%
Italy	2%

The U.S. uses more than the next 5 highest consuming nations combined.

Climate Change is real...



And creates REAL impacts.



Forest Health –Fuel Loads

- 2002 Wildfires
 - 7 Million Acres
 - Could have met 22% of US annual energy demand.



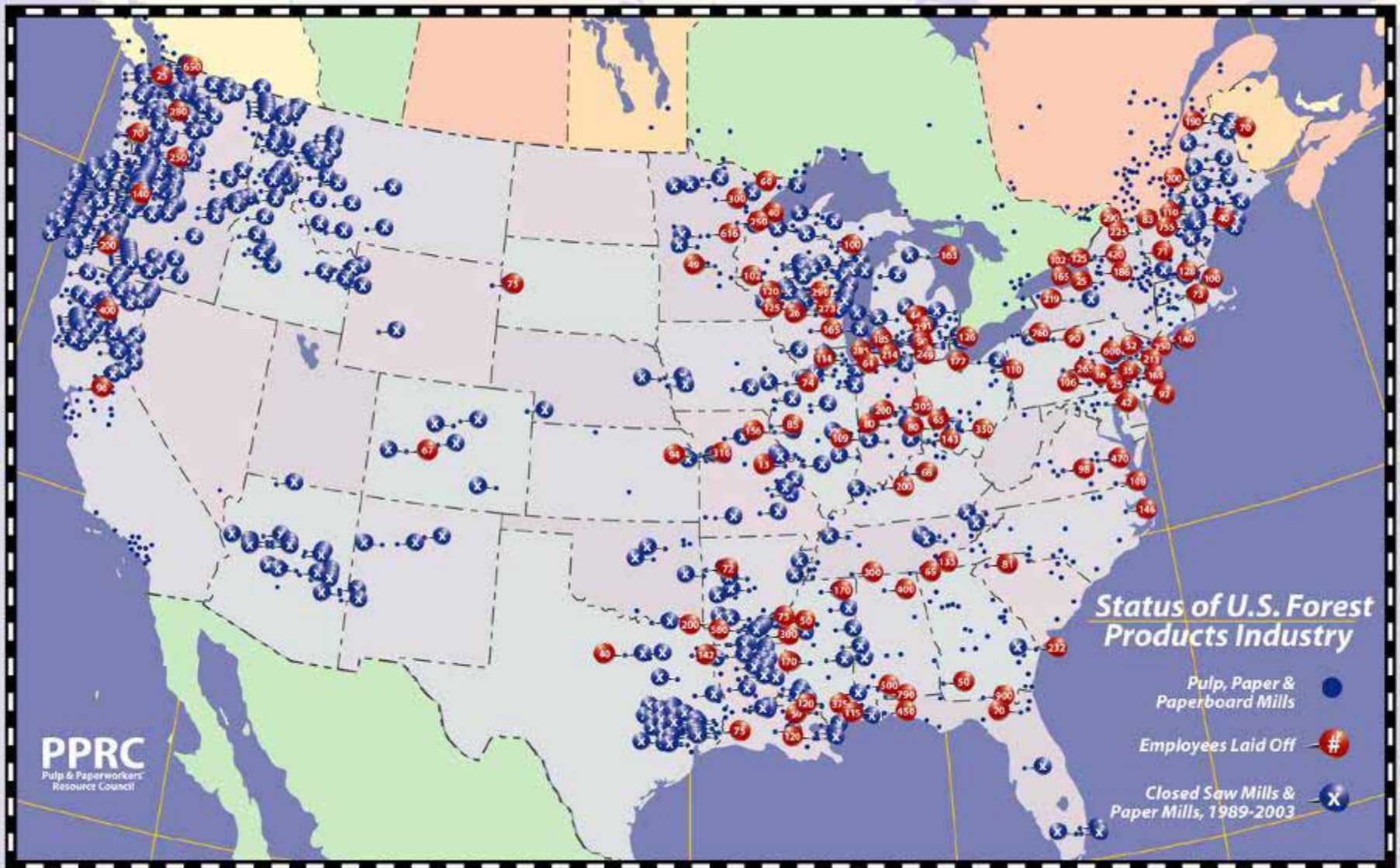
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Forest Health - Pests



- All too often, impacted trees are failed to be utilized.
- SPB in TN 1999-2001
 - 400,000 Acres
- MPB in BC ~ 2014
 - 43 Million Acres
 - Size of Uruguay

Community & Market Development

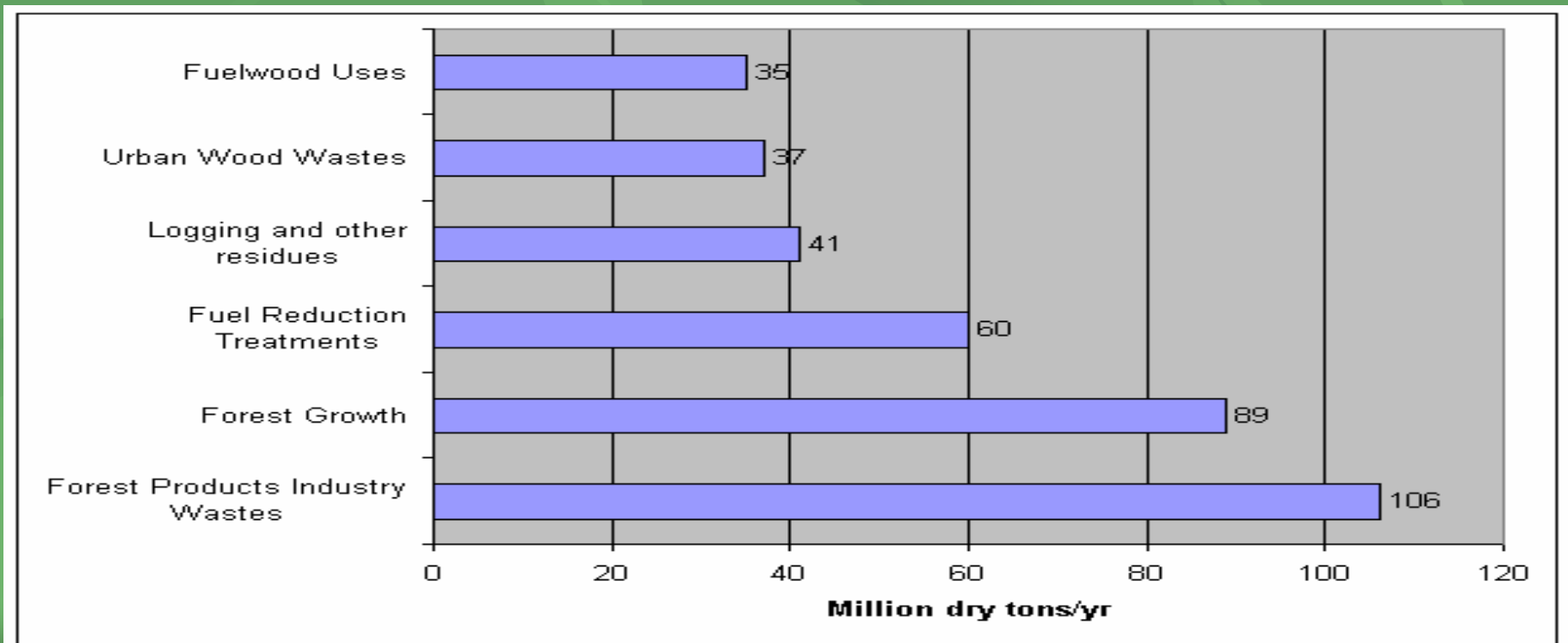


Woody Biomass

- Woody biomass includes harvesting and thinning residues, and thinnings from hazardous fuel reduction, habitat improvement, and other ecosystem restoration projects
 - Trees & woody plants, including limbs, tops, needles, leaves, and other woody parts.
 - Products of forest management, restoration, hazardous fuel reduction treatments, and production wastes (ie. Black liquor).

USDA-DOE Vision Paper

- Displace 30% of petroleum consumption with biomass resources by 2030; 1 Billion Tons Annually.
 - 368 Million dry tons from Forest Resources



Future Targets

- Bioenergy
 - 5% by 2030
 - Combustion
 - Co-firing
 - Synthetic natural gas
- Biofuels
 - 20% of nation's transportation fuels by 2030
 - Methanol
 - Ethanol
 - Biodiesel
- Specialty Chemicals and Products
 - 25% of chemical base by 2030

Bioenergy

- The “lowest hanging fruit”.
 - Forest Industry is 65% or better at being self-sustained.
- Feedstock variable
 - Whole-tree chips: 4500Btu/lb
 - Mill chips: 5100 Btu/lb
 - Pellets: 8200 Btu/lb
- Typically reduce net CO₂ emissions by 90%+.

Bioenergy Scale

- Large Scale
 - District Energy of St. Paul
 - 25 MW power-plant
 - All with urban wood waste
 - Downtown heating and cooling with excess added to grid



Bioenergy Scale

- Small Scale

- Vermont Schools

- 1000 tons of green chips yearly.
 - \$0.20 per square foot cost.

- Memorial Medical (WI)

- 3500 tons chips from local hardwood facility.
 - 210,000 square feet heated.



More Bioenergy

- Mali
 - 80% of energy demand met by biomass
 - Wood energy is over half the contribution
 - 500,000 people employed, 60% women
- China
 - 500 Million tons of wood pellets by 2015.
- Italy
 - 76 Biomass power or district heating plants
 - Mainly poplar feedstocks

Biofuels

- Pres. Bush's 2006 State of the Union
 - Ethanol from wood chips
 - Technology competitive within 6 years (GOAL).
 - Replace more than 75% of our oil imports from the Middle East by 2025 (GOAL).
 - \$250 million to help achieve "homegrown cellulosic ethanol".
 - New DOE RFP announcement

Biofuel Utilization

- Brazil: 17 Billion Liters Annually of Ethanol
 - 85% of all automobiles flexi-fuels
- Sweden: 95% of all automobiles flexi-fuels
 - Incentives for commuters who use non-petroleum based fuels.
- Ukraine: Promising Future Targets
 - 2 Million Liters Ethanol by 2010
 - 2 Million Liters Biodiesel by 2015

Biofuel Utilization

- United States
 - 5 Billion gallons this year
 - Blended in every gallon in NY & CA
 - Goal: 7.5 Billion by 2012
- CORN CORN CORN
 - Usage for Ethanol production surpassed exports!
- Indy Racing League = Ethanol 2007

Biobased Chemical Industry

- Petroleum substitute for plastic industry
 - PDO, PLA, and 3-HP
- Enzymes
 - Lactose free dairy, cleaning supplies
- Liquefaction Oils
 - Lubricants, octane-additives, explosives
- Adhesives, Inks, Tapes, and various salts
 - Hickory-flavor

Chemical Industry in Action

- Bioplastics:
 - 40,000 T of bioplastics used in EU 2003
 - 2008 Summer Olympics all bioplastic packaging
 - 600,000 T worldwide by 2008
- Sony using PLA for the newest I-Pods
- Specialty Chemical Markets climbing 10-20% yearly.

Biobased Materials

- Tencel: Wood-based textile described as the “best thing since cotton”.
- Char: Activated carbon and base for a high nutrient fertilizer.
- Fiber Composites: Ceramicrete, a replacement for traditional cement.

Barriers to Biomass Utilization

- Low cost of fossil-based energy
 - Ave. US Price/Barrel over last 100 years: ~ \$20

Barriers to Biomass Utilization

- Low cost of fossil-based energy
- Difficult to obtain capital for 1st Generation Systems
 - Corn to Ethanol Plant
 - 100 Million gallons annually = \$150 Million Capital
 - Wood to Ethanol Plant
 - 100 Million gallons annually = \$540 Million Capital

Barriers to Biomass Utilization

- Low cost of fossil-based energy
- Difficult to obtain capital for 1st Generation Systems
- **Technology Issues**
 - Limited Long Term Pilot Demonstrations
 - R&D Inefficiencies
 - Lack of Technical Assistance, Engineering Design Firms, Technology Transfer Organizations
 - Will emerging technologies breed downfall?

Barriers to Biomass Utilization

- Low cost of fossil-based energy
- Difficult to obtain capital for 1st Generation Systems
- Technology Issues
- Feedstock Availability and Costs

Harvest Site Comparison

Logging only



Logging with Fuel Market



The Problem is ?

Transportation and Harvesting

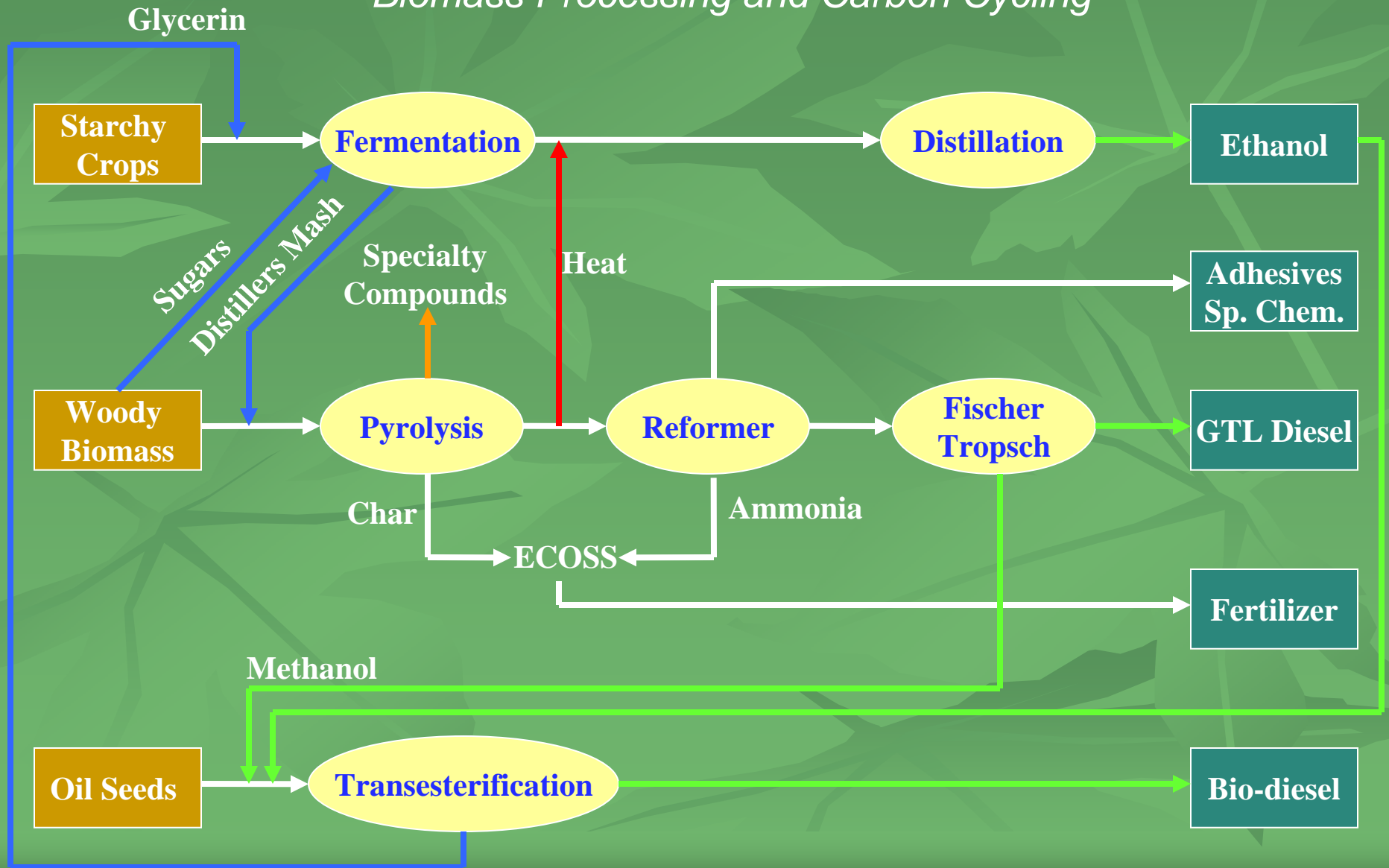


Barriers to Biomass Utilization

- Low cost of fossil-based energy
- Difficult to obtain capital for 1st Generation Systems
- Technology Issues
- Feedstock Availability and Costs
- **Interests typically focused on a single feedstock and product**
 - More vulnerable to supply and demand swings
 - Need to incorporate bio-refinery concept/LEGOS

THE INTEGRATED BIOREFINERY

Biomass Processing and Carbon Cycling



Barriers to Biomass Utilization

- Low cost of fossil-based energy
- Difficult to obtain capital for 1st Generation Systems
- Technology Issues
- Feedstock Availability and Costs
- Interests typically focused on a single feedstock and product
- **Lack of level playing field compared to fossil fuels and access to energy markets**
 - 100 years to build current system
 - 2 of the largest worldwide industries

Barriers to Biomass Utilization

- Low cost of fossil-based energy
- Difficult to obtain capital for 1st Generation Systems
- Technology Issues
- Feedstock Availability and Costs
- Interests typically focused on a single feedstock and product
- Lack of level playing field compared to fossil fuels and access to energy markets
- **Poorly informed investors, consumers, and general public.**

What Is Being Done?

- On the federal level
- On the state

Woody Biomass Utilization Group

- Reports to the BIOMASS BOARD
 - Responsible for coordinating Federal activities for the purpose of promoting the use of bio-based industrial products.
 - Board reports to the White House.
- Established by Congress
 - R&D Act of 2000
 - 2002 Farm Bill
 - Energy Policy Act of 2005

Woody BUG Members

- USDA
 - CSREES
 - Forest Service
 - Rural Development
- Dept. of Energy
- Dept. of Interior
- EPA
- Dept. of Transportation
- National Science Foundation
- Office of Science & Technology Policy
- Federal Environmental Exec
- Associated Partners
 - Department of Defense
 - Department of Commerce
 - National Association of State Foresters
 - National Association of Conservation Districts
 - Western Governors Association
 - Wildland Fire Leadership Council

What does WBUG do

- Serves as a research/education clearinghouse
- Technical & Policy Advisors for agencies
- Builds collaborations with non-Federal partners
- Implements Federal MOU

Fuels For Schools and Beyond

Tuesday, October 24,

Info

[Getting Started](#)

[Fundamentals](#)

[Frequently Asked Questions](#)

[Project Sites](#)

[Air Quality Information](#)

[Biomass Boiler Market Assessment](#) **New!**

[Business Outlook \(245kb\)](#)

[Darby Pilot Project](#)

[Photo Page](#)

[New Information](#)

[Sponsors](#)

[PowerPoint Presentations & Publications](#)

Click on the photo below to read about Kellogg, ID



Mission

To promote and encourage the use of wood biomass as a renewable, natural resource to provide a clean, readily available energy source suitable for use in heating systems in public and private buildings.

To facilitate the removal of hazardous fuels from our forests by assisting in the development of viable commercial uses of removed material.

Click on the Idaho, Montana or North Dakota state logo to visit their Fuels for Schools website.

Links

[Bitter Root RC&D](#)

[Biomass Energy Resource Center](#)

[North Dakota: Fuels Study by Environmental Energy Research Center \(1.4 mb\)](#)

[Manufacturers & Consultants](#)

[Contacts](#)

Updated: 10/22/2006

Research Partnerships

- Genomic Research for Ethanol Production
 - NCSU
- Woody Biomass as Alternative Farm Products
 - SUNY
- Incentives for Bioenergy & NIPF
 - Florida, Arkansas, VPI
- Smallwood Utilization Technologies
 - Small Business Innovation Research grants

Workshops

- SAF Meetings in:
 - Florida
 - Texas
 - Kentucky
- Stakeholder Meetings in:
 - Colorado
 - Georgia
 - North Carolina
- SmallWood 2006
- Annual National Nursery Conference

Regional programs

- U California Woody BUG
- UGA Biorefinery & Carbon Cycling Center
- Delaware Bioenergy Consortium
- SAUBR
- Mississippi biomass Council

Sun Grant Initiative

UT, SDSU, OK St, OR St, Cornell



Southeastern SunGrant Center

wood manufacturing waste.⁶ It is important to note that 99% of this manufacturing waste is already in use through established markets in items such as fuel, fiber for pulp and panels, and mulch. An estimated 100,000 dry tons of urban wood wastes are generated in the state each year.⁶ There are currently 5-6 logging operations in the state that are not only harvesting timber, but are also harvesting woody biomass. These operations primarily sell wood waste through fuel wood markets.⁵

Alabama's Biomass Resources, 2003

Corn Produced

16,050,000 bushels

Soybeans Produced

4,725,000 bushels

Wheat Produced

3,360,000 bushels

Conservation Reserve Program

448,704 acres enrolled

Municipal Solid Waste

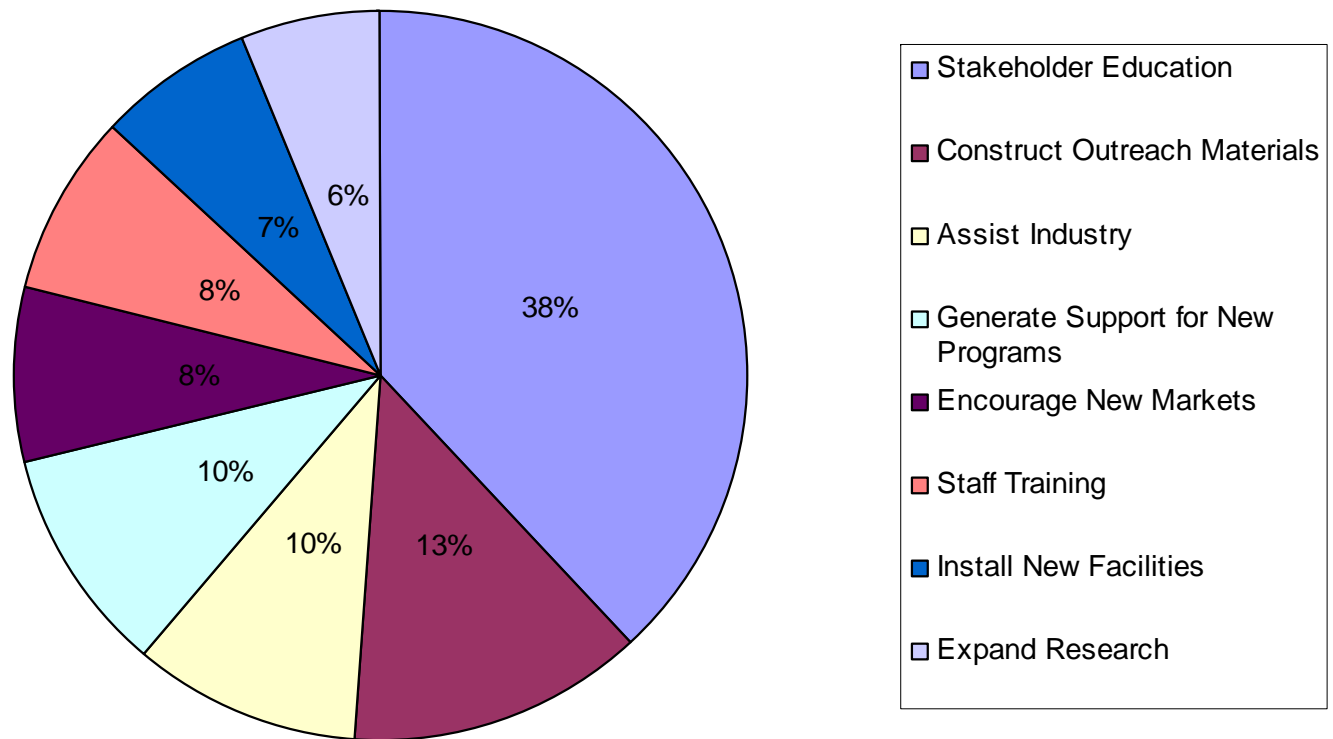
Determining the amount of agricultural biomass that could be available from crops, but more importantly crop residues, is difficult to quantify. In Alabama, it was estimated that 19,267 dry tons of agricultural residue biomass could be produced for less than \$50 per ton.⁷ If short rotation wood crops, such as poplars and willows, are considered, an estimated 6,588,812 dry tons could be produced each year.⁷ Poultry production in the state also produces a valuable amount of biomass. These operations produce approximately 1.5 million tons of litter per year.⁸

Sustainable Forestry for Bioenergy and Biobased Products –Training Grant

- USDA Rural Development Systems grant
- Southern Forest Research Partnership guidance
- Synthesize the available scientific and technical knowledge
- Produce a wide variety of information and technology products
- Craft curricula, training events, and programs



Stakeholder Needs



Parting Thoughts

- No Magic Bullets
- Oil Prices Not A Friend of Clean Energy
- Market-minded Framework

For Continued Information

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